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## IV. MANAGEMENT DIRECTION

### Introduction

The Service manages fish and wildlife habitats considering the needs of all resources in decision-making. But first and foremost, fish and wildlife conservation assumes priority in refuge management. A requirement of the National Wildlife Refuge System Improvement Act of 1997, is for the Service to maintain the ecological health, diversity, and integrity of refuges. The refuge is a vital link in the overall function of the ecosystem. Refuges in the Central

Gulf Ecosystem include managed forests and wetlands for waterfowl. To offset the historic and continuing loss of these habitats within the ecosystem, the refuge and other public lands provide the biological "safety-net" for migratory non-game birds and waterfowl, threatened and endangered species, and resident species.

### Vision

The vision for Noxubee National Wildlife Refuge is to manage the refuge so that it exemplifies a model of land management with a wide diversity of native flora, fauna, and habitats. The refuge someday will be a 56,000-acre



*Flooded bottomlands  
USFWS Photo*

contiguous tract of land pieced together by connecting habitats of pine forests, old growth and mixed structural pine/hardwood forests, cypress/tupelo swamps, wetlands, Alabama black belt prairie, and vast stands of bottomland hardwood forests. The foreseeable future is one where conservation, partnerships, habitat management, research, and priority public uses, including environmental education, will be part of refuge management practices. Wildlife abundance and high quality facilities will attract many visitors each year. Partners will collaborate to provide a wide range of public use and educational activities, allowing the refuge to contribute to the region's economic stability and enhance the quality of life in central Mississippi.

### Goals, Objectives, and Strategies

The goals, objectives, and strategies addressed below are the Service's response to the issues, concerns, and needs expressed by the planning team, refuge staff, and public. These goals, objectives, and strategies reflect the Service's commitment to achieve the mandates of the National Wildlife Refuge System Improvement Act, the mission of the National Wildlife Refuge System, the North American Waterfowl Management Plan, and the purpose and vision

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for which Noxubee National Wildlife Refuge was established. The following pages describe the goals established for major management areas, objectives for achieving those goals, and the specific strategies that will be employed by refuge staff. The goals are organized in broad categories of Habitats, Fish and Wildlife Populations, Land Protection and Conservation, Education and Visitor Services, Cultural Resources, and Refuge Administration.

**Goal A: Habitats**

Perpetuate a diversity of high quality, more natural-like communities as habitats for trust and resident species.

*Objective A.1 Pine and Pine/Hardwood Forest Stands*

Maintain species diversity within 26,470 acres of pine and pine/hardwood forests (as outlined in the current Forest Management Plan) that emphasizes providing habitat for the endangered red-cockaded woodpecker and other wildlife dependent on late successional pine habitat.

*Discussion:* A long-term refuge and Central Gulf Ecosystem goal includes supporting recovery efforts for the red-cockaded woodpecker. Red-cockaded woodpeckers have very specific requirements to support reproduction and foraging. It is the only endangered species that is a permanent resident of the refuge. Forty-five groups are located and mapped on refuge lands. Management for this species is directed by the Red-cockaded Woodpecker Recovery Plan, which specifies a target population of 88 groups for the refuge. The refuge maintains a diversity of vegetative conditions and complex forest structure in its pine and pine/hardwood stands to support habitat requirements for red-cockaded woodpeckers, migratory birds, and a host of resident species. The current forest management plan is designed to ensure that late successional pine habitats are available to sustain and expand overall red-cockaded woodpecker populations.

Disturbance patterns created by natural processes such as fire are essential for maintaining biodiversity. For example, the use of prescribed burns for lowering the risk of catastrophic wildfires and maintaining characteristic patterns of vegetation is an applied practice on refuges. Noxubee refuge uses prescribed burns to simulate historic disturbance patterns that help sustain the patchwork of native communities or seral stages that naturally occur within the landscape. The refuge's fire management program is designed to maintain habitat conditions as well as to protect life, property, and natural resources.

Habitat management can include intensive forest applications including commercial timber harvests and prescribed burning to maintain desired stand structure. The refuge manages a mosaic of 26,470 acres of upland pine and pine/hardwood habitats, of which 4,000 to 8,000 acres per year are burned to mimic an understory fire disturbance regime (a regime in which fires are generally not

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lethal to the dominant vegetation and do not substantially change the structure of dominant vegetation). Approximately 80 percent or more of the above-ground dominant vegetation survives fire, leaving mainly mature and old growth trees.

*Strategies:*

- A.1.1 Evaluate pine and pine/hardwood compartments every 10 years.
- A.1.2 Ensure regeneration of approximately 1 percent of pine and pine/hardwood acreage each year.
- A.1.3 Monitor active and artificial cluster areas and regulate basal areas to 50-80 sq. feet/acre.
- A.1.4 Monitor remaining area, and when basal areas exceed 100, thin to 75-85 sq. feet/acre, primarily to guard against devastating attacks by southern pine beetles.
- A.1.5 Reduce and prevent mid-story development primarily through prescribed burning on a 1- 4-year cycle and using mechanical control when necessary.
- A.1.6 Continue to research effects of prescribed burning on individual plant and animal species and on natural communities.

*Objective A.2 Hardwood Forests*

Maintain species diversity within 15,308 acres of hardwood forest stands and increase overall mast production and regeneration of mast producing species. This would follow the current Forest Management Plan designed to emphasize older-aged classes that support late-successional migratory birds and resident wildlife.

Discussion: Habitat diversity is achieved by managing forest stands of varying species composition and age. Because little of the refuge bottomland hardwood forest area is home to endangered species, much of it is managed to support waterfowl and other migratory birds.

The refuge is located off the principal migratory route and wintering range of most waterfowl species. However, it provides a major wintering and breeding area for wood ducks. At times, significant numbers of mallards also utilize the bottomlands as a wintering area. Forest management for wood ducks focuses on protecting nest cavity trees along waterways and enhancing food production.

Several neotropical migrant birds also depend on hardwood forest habitat for breeding and/or stop-over habitat during migration. Some of these species need late successional hardwood stands with mature canopies, while others need early successional habitats such as shrubs and saplings.

Events like windstorms, tornadoes, and flooding by beavers are natural disturbances that affect hardwood forests and drive cycles of regeneration. Managers use timber harvesting to mimic these events and produce stands that resemble those found in natural forests. Selective harvesting helps generate uneven-aged stands

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and the heterogeneity that supports biodiversity. Selective thinning is designed to favor tree species that produce mast and cavities.

*Strategies:*

- A.2.1 Evaluate bottomland hardwood compartments every 15 years.
- A.2.2 Ensure regeneration of approximately 0.5 percent of hardwood acreage per year.
- A.2.3 Regulate stand composition to favor hard- and soft-mast producing trees.
- A.2.4 Restore hydrology where needed (through beaver control and dam removal) to minimize water retention during the growing season.

*Objective A.3. Waters and Wetlands*

Maintain existing species diversity in 300 acres of moist-soil impoundments, 1,900 acres of lakes, and 1,150 acres of greentree reservoirs with emphasis on supporting habitat for migratory birds (e.g., wood ducks and mallards), colonial nesting birds, and native aquatic fauna; develop a comprehensive water quality monitoring program refuge-wide.

*Discussion:* Current management of lakes and wetlands provides habitat for wintering waterfowl and resident species. Bluff and Loakfoma lakes are drawn down during summer to encourage growth of wetland plants that are valuable as waterfowl food. The lakes are filled again in the fall to allow waterfowl access to these food plants. Greentree reservoirs are managed similarly through forest management that enhances mast production and the manipulation of water levels to mimic natural flooding regimes, and makes mast crops available to waterfowl. Managed wetlands like the Prisock moist-soil areas are also manipulated to benefit waterfowl. These impoundments are either disced or mowed to encourage the growth of natural waterfowl foods, or they are planted with such crops as millet to serve as a food source. Although providing waterfowl habitat is often the driving force in managing lakes and wetlands, benefits extend far beyond waterfowl. Hundreds of other wildlife species such as wading birds, water birds, reptiles, and amphibians benefit from the management of these wetland areas.

Another key function of refuge forests is to sustain natural flood events. Protecting and restoring natural-like flooding regimes is essential to conserving riparian areas, ephemeral wetlands, and moisture gradients that are crucial to maintaining habitat diversity.

Sport fish species found in refuge waters include largemouth bass, crappie, bream, and catfish. These populations can be enhanced by active management such as stocking, creel, and size limits. Sportfishing is a very important public use on the refuge, and some controversies arise when fishery management conflicts with waterfowl management.

Numerous non-game species are found in aquatic and wetland habitats on the refuge. Comprehensive surveys of fish, mussels,



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amphibians, and reptiles are needed to improve management of these species. At least six threatened and/or endangered mussel species are known to occur in nearby waters, and may possibly occur on the refuge. Previous mussel surveys documented more than twenty-two species occurring in refuge waters. A shell of the threatened orange-nacre mucket was also found in refuge waters.

Hollis Creek receives treated sewage from the city of Starkville's sewage ponds, and the Browning Creek floodplain contains a concentrated animal feeding facility directly upstream of the refuge. For these reasons, these waterways are considered to have a high risk of possible contamination or pollution and are currently monitored.

Long-term land-use changes are occurring in the Noxubee watershed as urban development continues, additional highways are built, and shifts occur in farming and forestry practices. These land-use changes affect local hydrology, and ultimately affect the overall hydrology of Noxubee River, Oktoc Creek, and other refuge waters. Such changes in the frequency, duration, and amplitude of flooding can greatly impact bottomland hardwood forests and other floodplain habitats. Currently, the nearest water gauge monitoring these changes is located on the Noxubee River near Macon, Mississippi.

*Strategies:*

- A.3.1 Manipulate water levels to favor moist soil-plant production.
- A.3.2 Disc, plow, and plant units.
- A.3.3 Control exotic, invasive, and nuisance plant species where appropriate.
- A.3.4 Control beaver populations and remove dams where appropriate.
- A.3.5 Continue monitoring of herpetofauna and mussel populations.
- A.3.6 Develop water quality monitoring program assessing the impact of environmental contaminants affecting the refuge.
- A.3.7 Work with U.S. Geological Survey to install water gauge on Noxubee River.

*Objective A.4. Fields/Grasslands*

Maintain fields and grasslands, including restoration of 958 acres of grassland/prairie habitat (grasses and light- and heavy-seeded broadleaf and tuberous perennials) at Morgan Hill.

*Discussion:* In 1993, the refuge embarked on a prairie restoration project with the assistance of Mississippi State University. A refuge field, Morgan Hill, is located on the western edge of the Alabama Blackbelt Prairie. Before settlement, this area consisted of a tall grass prairie where the dominant vegetation was big bluestem, little bluestem, switchgrass, and Indian grass interspersed with cedar and oak/hickory groves (Harper-Lore e. 1999). It is reported that buffalo once roamed this area. Test plots of Indian, switch, and big bluestem grasses were sown in 1993. No formal follow-up on these plots has been done since planting. Henslow's sparrows were recorded in the upper field. This is a significant find of this species,

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*Prairie warbler*  
*USFWS Photo*

which usually winters farther south  
(<http://www.mbr-pwrc.usgs.gov/id/framlst/i5470id.html>).

Over the long term, the refuge can support restoration of prairie grassland habitat at Morgan Hill by using surface fires (fires that burn litter and other live and dead fuels at or near the ground, mostly by flaming combustion) to mimic a historic fire disturbance regime, as well as mowing and planting. As in any native plant community, vigilant monitoring of invasive exotic species is a necessity, along with strategies for their suppression or removal.

In addition to Morgan Hill, the refuge maintains about 1,276 acres of open fields to provide habitat for edge- and field-dependent species. These field habitats are maintained in a variety of ways such as mowing, burning, and farming.

*Strategies:*

- A.4.1 Maintain open nature of fields and grasslands using prescribed fire, mowing, and farming.
- A.4.2 Supplement natural food production using traditional farming operations, the current cooperative farming program, and integrated pest management practices.
- A.4.3 Re-establish heavy-seeded and tuberous perennials to complete restoration at Morgan Hill.

*Objective A.5 Research Natural Areas and Wilderness*

Continue current management of two research natural areas and one wilderness study area within the guidelines of the Fish and Wildlife Service Manual and complete a wilderness review and study for the wilderness study area (research natural areas = 46-acre bald cypress swamp and 67-acre red cedar/pine/hardwood; wilderness study area = 1,090 acres).

*Discussion:* Wilderness study areas are inventoried refuge lands and waters within the planning area that meet the eligibility criteria for wilderness as defined by the Wilderness Act. The Wilderness Study Area at Noxubee refuge was designated as such in 1976, by the Director of the Fish and Wildlife Service.

Research natural areas and wilderness study areas are part of a national network of reserved areas under various ownerships (i.e., Fish and Wildlife Service, Forest Service, National Park Service). This network is the result of a designation system recognized by other federal land administering agencies.

Research natural areas are intended to represent the full array of North American ecosystems, biological communities, and habitats. They are areas where natural processes are allowed to predominate without human intervention. However, under certain circumstances, deliberate manipulation is used to maintain unique features that the research natural area was established to protect. Activities include research, study, observation, monitoring, and educational pursuits.

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Presently, the refuge has two areas established by the Society of American Foresters as research natural areas. The Old Robinson Road Research Natural Area was designated in 1959, and contains 46 acres of bald cypress swamp. The Morgan Hill Research Natural Area was designated in 1973, and contains 67 acres of red-cedar/pine/hardwood forest. There has been some interest in evaluating two additional areas for potential status—Pete's Slough and Douglas Bluff. Both of these areas exhibit habitats supporting unique, rare, and restricted plant species. The Douglas Bluff area has at least 85 species of herbs, shrubs, vines, and trees including uncommon and regionally rare chinkapin oak and fringe trees, pachysandra, early saxifrage, and bloodroot.

The Wilderness Study Area at Noxubee refuge was designated under a planning process described in the Department of the Interior, Final Environmental Impact Statement, Proposed Noxubee Wilderness Area, Mississippi. The Draft Environmental Impact Statement was submitted to the Council on Environmental Quality and the public on February 28, 1974, but final legislated designation did not occur. Since that time, the Service has protected and managed the wilderness attributes of this site. The Draft Environmental Impact Statement recommended 1,200 acres of seasonally flooded and timbered bottomland hardwoods as Wilderness within the National Wilderness Preserve System. In 2000, a wilderness inventory was conducted on the refuge, using a field review and the Service's Geographic Information System to calculate the boundary, as illustrated in the 1974 Draft Environmental Impact Statement. The decision was made to remove a portion along the eastern side of the refuge that had been previously impacted by timber harvesting and construction of a levee, and because it was very close to a private in-holding. The revised mapping indicated a total of 1,090 acres instead of the previous 1,200 acres recommended in the 1974 report.

A wilderness review is the process the Service uses to determine whether or not to recommend to Congress that refuge lands and waters be designated as Wilderness. The Service evaluates lands and waters that meet certain minimum criteria for wilderness, and then further evaluates the resulting wilderness study area to determine if it merits recommendation to the Secretary of the Interior for inclusion in the Wilderness System. The wilderness review process has three phases which include inventory, study, and recommendation. The refuge has conducted the preliminary inventory phase of the wilderness review. A wilderness study is conducted to analyze all values in a designated wilderness study area. Recommendations are made in an Environmental Impact Statement with input from the public.

*Strategies:*

- A.5.1 Coordinate research efforts with scientists and the research community.

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- A.5.2 Continue to manage the area as wilderness until all three phases of the wilderness review process have been completed.
- A.5.3 Coordinate future wilderness review with the public.
- A.5.4 Develop research objectives and management strategies for research natural areas.
- A.5.5 Evaluate Pete's Slough and Douglas Bluff as candidates for research natural area designations.

*Goal B: Fish and Wildlife Populations*

Continue to protect, maintain, and enhance populations of trust and native plant and animal species within the guidelines of the Central Gulf Ecosystem Five-Year Action Plan, the Red-Cockaded Woodpecker Recovery Plan, the North American Waterfowl Plan, the Partners-in-Flight Plan, and the Noxubee National Wildlife Refuge Forest Management Plan.

*Objective B.1 Trust Species*

Monitor and maintain healthy populations of red-cockaded woodpeckers, waterfowl, and other migratory birds (with emphasis on late-successional migratory birds), and conduct refuge inventory and monitoring to evaluate and improve management practices for trust species on refuge lands.

*Discussion:* Present refuge management of trust species includes red-cockaded woodpeckers, wood storks, eagles, waterfowl, and neotropical migratory birds. Biological integrity, diversity, and environmental health of trust species on the refuge are surveyed and monitored through cooperation, assistance, and continued partnerships from others. Noxubee refuge plays an instrumental role in the recovery of the red-cockaded woodpecker and managing for wood ducks, mallards, and other waterfowl populations.

Population management activities, even those implemented to benefit single species, can to the extent practical, contribute to broad diversity of indigenous flora and fauna. Forests that support the red-cockaded woodpecker also support a variety of migratory bird and resident wildlife species.

Several neotropical migratory bird species are imperiled through habitat loss, and can benefit from active habitat management. Refuge management can be directed to benefit different groups of bird species, such as those dependent on interior forest habitats or those dependent on early-successional habitats.

*Strategies:*

- B.1.1 Continue monitoring, cavity augmentation, and predator control of red-cockaded woodpeckers to reach or exceed population target of 88 groups.
- B.1.2 Monitor waterfowl populations as part of the Service's efforts to track continental populations and to determine responses to management actions. This will include regular



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- waterfowl surveys as well as maintaining and monitoring wood duck boxes.
- B.1.3 Monitor populations of other migratory birds through breeding bird point counts as part of the Service's Partners-in-Flight program to determine species responses to management actions.
  - B.1.4 Monitor wading birds as appropriate.
  - B.1.5 Maintain approximately 150 wood duck nest boxes.
  - B.1.6 Annually band 200 pre-season wood ducks in support of Service monitoring efforts.
  - B.1.7 Continue monitoring populations of cormorant roosts in cooperation with U.S. Department of Agriculture, Division of Wildlife Services.

*Objective B.2 Resident and Other Species*

Manage to maintain healthy, resident wildlife populations including white-tailed deer (average harvest range 400-600 deer) and turkey.

*Discussion:* The refuge forests, wetlands, and grasslands are managed to ensure healthy, viable resident wildlife populations consistent with sound biological principles and other objectives of this plan.

White-tailed deer have the potential to adversely affect habitats unless their numbers are kept at or slightly below the carrying capacity. The refuge hunt program is designed to maintain the herd while offering quality hunting opportunities to the public. The population of deer has remained fairly stable through a public hunt program. An appropriate harvest (related to habitat conditions) will be maintained with occasional fluctuations due to weather and habitat conditions. Population level indicators will include monitoring harvest data and conducting periodic health checks.

Other game mammals open for public hunting include raccoons, rabbits, squirrels, and the incidental taking of beavers, coyotes, and feral hogs. These species may also have an adverse impact on other species in the event of overpopulation. Nest predation on turkeys, wood ducks, and songbirds may become so great as to limit their reproductive success. Overpopulation may also facilitate the spread of canine distemper, a common close contact type disease, to other species such as foxes, coyotes, and domestic dogs. In an effort to prevent coyote overpopulation, the species is considered an incidental harvest species and may be taken during any open hunting season.

Populations of bobwhite quail and wild turkey remain stable on the refuge; however, quail populations have declined markedly throughout the southeast. Loss of early successional habitat is most commonly cited as causing the quail decline. Numerous other declining bird species, such as loggerhead shrikes, prairie warblers, and indigo buntings are associated with these habitats as well.

Reptiles, amphibians, and bats are abundant on the refuge and important indicators to evaluate the environmental health of the

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ecosystem. Knowledge of which species occur on the refuge is fundamental to an understanding of the biological diversity of the area.

*Strategies:*

- B.2.1 Coordinate hunting regulations for resident wildlife with state agencies to maintain population health and stability.
- B.2.2 Monitor and manage the population of white-tailed deer and waterfowl at current levels.
- B.2.3 Identify and implement additional management activities to benefit bobwhite quail and other early successional wildlife species.
- B.2.4 Identify thresholds of disturbance and develop associated standards and techniques that can be applied, where appropriate, to reduce conflicts and achieve balance between the public and wildlife.
- B.2.5 Coordinate management and safety issues with Service public use specialists and game enforcement officials.

*Objective B.3 Exotic, Invasive, and Nuisance Plants and Animals*

Control exotic, invasive, and nuisance species (e.g., beaver) to levels that do not negatively affect trust species.

*Discussion:* American lotus is an invasive species found in refuge lakes and sloughs. Lotus plants form dense mats which shade out other more desirable plant species that have greater value to wildlife. In addition, lotus can impede water flow and recreational use. Lotus in refuge lakes has been moderately controlled with herbicides over the past 10 years.

Kudzu and cogon grass are exotic pest plants that affect refuge uplands. Where they occur, they often form thick monotypic stands that crowd out other desirable plants. These species have been controlled with herbicides over the past 4 years.

Bicolor lespedeza and Chinese privet are two additional exotic pest plant species which are so widespread over the refuge that control efforts are difficult. Water hyacinth is an aggressive exotic plant that occurs in the Tennessee-Tombigbee River and must be monitored more vigilantly.

Beavers are native to the refuge; however, their dam building activity can cause extensive flooding and kill large acreages of bottom-land hardwood forests. In addition, their habit of burrowing can damage refuge levees and roads. Feral hogs occasionally become a problem on the refuge, as their rooting destroys understory vegetation. Both beaver and hog populations have been controlled for more than 20 years.

*Strategies:*

- B.3.1 Maintain monitoring and control programs for exotic plant species that invade/compromise habitat quality.

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- B.3.2 Use integrated pest management techniques to reduce lotus, kudzu, and cogon grass infestations to levels that do not negatively affect trust resources.
- B.3.3 Develop an Integrated Pest Management Plan consistent with Beaver Control Plan.
- B.3.4 Coordinate results of information concerning success/failure of control treatments within and outside the agency, especially in regard to lotus and kudzu.
- B.3.5 Investigate control methods for Chinese privet and bicolor lespedeza.

***Goal C: Land Protection and Conservation***

Protect and improve conditions for fish, wildlife, habitats, special management areas, and wilderness through the use of current land protection programs, laws, policies, and partnerships.

*Discussion:* Included in the approved acquisition boundary of the refuge are 8,556 acres of non-refuge lands (Fig. 8). Of that, the Section 16 properties owned by the State of Mississippi and Mississippi State University's John Starr School Forest are permanently protected and will not be acquired by the Service. The remaining 4,263 acres of private in-holdings could potentially be acquired. If so, these properties would be managed by the Service to sustain the same values and functions of the refuge's existing habitats that help support native biological diversity.

Although funding for land acquisition can come from the Land and Water Conservation Fund and the Migratory Bird Conservation Fund, the Service often acquires available private land in-holdings using a land-for-timber exchange. Infrequently, it will use a land-for-land exchange. With land-for-timber exchanges, local timber contractors are contacted who will negotiate with the in-holder based on Service appraisal of the land. If the owner accepts the appraised value, the timber contractor will purchase the property. The refuge will then exchange a quantity of timber of equal value for the land. Timber selected for exchange is obtained from stands in need of thinning or regeneration for wildlife habitat.

Conservation easements and leases can sometimes be used to obtain minimum interests necessary to satisfy refuge objectives, if the refuge staff can adequately manage uses of the areas for the benefit of wildlife. The Service can negotiate management agreements with local and state agencies, and accept conservation easements. Some parcels within the approved refuge acquisition boundary may be owned by other public or private conservation organizations. The Service can work with interested agencies to identify additional areas needing protection or landowners needing technical assistance. The acquisition of private lands is entirely contingent on the landowner's willingness to participate. The refuge is responsible for nine Farmers Home Administration Conservation Easements in six counties totaling 796.05 acres. To meet compliance standards, these easements are reviewed on an annual basis by Service staff.

*Objective C.1 Land Acquisition and Conservation Easements*

Seek to acquire 4,263 acres of private land in-holdings within the existing approved acquisition boundary and work to expand acquisition boundary to allow acquisition of an additional 5,200 acres outside the current boundary. Also continue managing nine Farmers Home Administration Conservation Easements.

*Discussion:* The proposed expansion areas include approximately 5,200 acres of privately owned lands to the north and east sections of the refuge (Fig. 8 ). The expansion area of approximately 2,600 acres is north of U.S. Highway 25, in Oktibbeha County. The east expansion area of approximately 2,500 acres is primarily northeast of the Noxubee River in Noxubee County. These lands will assist in increasing populations of species associated with upland pine forests (i.e., pine warbler). The endangered red-cockaded woodpecker is found on refuge lands near the northern boundary. The proposed expansion area on the east side of the refuge includes species associated with bottomland and riverine habitats (i.e., prothonotary warbler).

The north expansion area is primarily short rotation loblolly pine plantations while the east expansion area is a mixture of cutover forest land, pine plantations, and pasture land. The vegetational community consists primarily of grasses, sedges, shrubs, young trees, and unharvested cull trees. Natural forest vegetation consists primarily of oaks, hickories, blackgum, and sweetgum. Mid-story trees or shrubs consist of possum haw, paw-paw, ironwood, wax myrtle, and wild azalea. Other smaller vegetative species that occur include poison ivy, common elderberry, blackberry, trumpet vine, palmetto, and green briars.

*Strategies:*

- C.1.1 Establish a new acquisition boundary that would encompass an additional 5,169 acres.
- C.1.2 Establish acquisition priorities based upon habitat values and/or possible threats to existing resources.
- C.1.3 Initiate and continue contact with all landowners within the refuge acquisition boundary to determine landowner interest and willing-seller status.
- C.1.4 Continue to utilize and seek partnerships with conservation organizations and others to complete acquisitions.
- C.1.5 Work with loggers and timber companies to conduct timber-for-land exchanges.

*Objective C.2 Conservation Partnerships*

Develop and maintain new partnerships with states, tribes, nonprofit organizations, academia, private landowners, and businesses to broaden support for the refuge.

*Strategies:*

- C.2.1 Increase participation and coordination with the Service's private lands biologist in Jackson, Mississippi, to implement,







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locally, the Partners for Fish and Wildlife program, and other conservation programs available that offer incentives and technical assistance to landowners.

- C.2.2 Increase communication to promote wildlife conservation with landowners and community groups.
- C.2.3 Continue outreach techniques using Internet web page, newsletters, and local events.
- C.2.4 Participate in National Wildlife Refuge System outreach events and other system activities.

***Goal D. Education and Visitor Services***

Develop, maintain, and support recreation and education opportunities that promote fish and wildlife conservation consistent with Service mission, refuge purpose, and Service policy.

*Discussion:* Noxubee refuge has an excellent reputation, regionally, as a steward of public lands. The refuge has created education and visitor service programs that give the public an opportunity to learn about and enjoy fish and wildlife resources. In fact, education and recreation are playing key roles in assisting the refuge to integrate biodiversity education and recreation programs, such as hunting and environmental education. (See Figure 9, Existing and Proposed Visitor Facilities.)

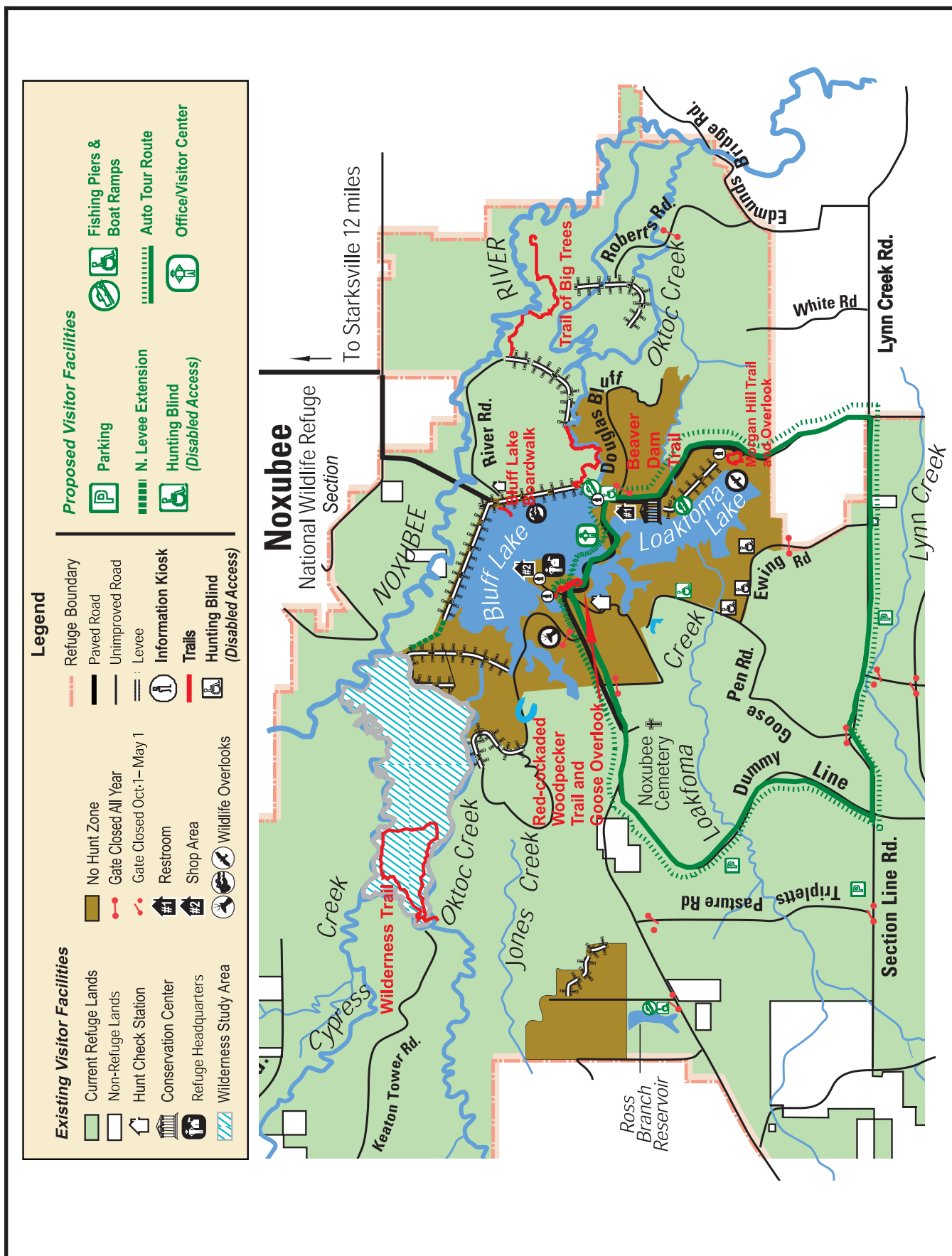
Consistent with the provisions outlined in the National Wildlife Refuge System Improvement Act of 1997, the Service provides recreation opportunities that reflect the unique qualities and features of national wildlife refuges. Refuge programs provide the public with an opportunity to learn about, enjoy, and appreciate fish and wildlife. These activities are increasing visitor use, but should, if properly managed, be able to continue without impacting the natural environment.

***Objective D.1 Hunting***

Where appropriate, provide hunting opportunities to manage deer populations (average annual harvest range 400-600 deer), and provide small game and waterfowl hunting opportunities.

*Discussion:* Hunting is a tool used extensively throughout the National Wildlife Refuge System to manage wildlife populations, and is one of the six priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. If properly conducted, hunting provides a biologically sound form of outdoor recreation. Refuge management provides habitat for a wide variety of game species. Management of these species is a collaborative effort with the Mississippi Department of Wildlife, Fisheries, and Parks. Achievement of habitat and population management objectives is primary in establishing hunting opportunities. In 1994, the Service adopted a hunt plan that describes management for white-tailed deer, small game, and turkey. The plan ensures that animals are taken only from populations capable of sustaining harvests. The hunting program is coordinated annually with the Mississippi Department of Wildlife, Fisheries, and Parks. Deer hunting is one

Figure 9. Existing and Proposed Visitor Facilities



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of the most popular recreational activities on the refuge and deer seasons are held for archery, primitive weapons, modern firearms, and youth/adult gun hunts. Hunting activities are managed so as not to cause disturbance to the endangered red-cockaded woodpecker.

Greentree reservoirs provide some opportunity to allow waterfowl hunting without causing disturbance to waterfowl using the refuge's moist-soil units. Waterfowl hunting is managed on the refuge and there could be potential to expand hunting opportunities where appropriate and compatible.

*Strategies:*

- D.1.1 Monitor deer populations via harvest data and periodic health checks to maintain a healthy population and sustainable harvest.
- D.1.2 Maintain well-defined boundaries around areas closed to hunting to ensure the safety of refuge visitors and provide a high quality experience for the hunter.
- D.1.3 Annually review hunt regulations in coordination with Mississippi Department of Wildlife, Fisheries, and Parks' biologists to assist in achieving balanced and healthy game populations.
- D.1.4 Evaluate potential impacts of hunting on other refuge activities and programs.
- D.1.5 Develop additional hunting blinds for disabled hunters.
- D.1.6 Develop vehicle parking areas to facilitate safe access to hunting areas.

*Objective D.2 Fishing*

Maintain sufficient game fish populations at Bluff and Loakfoma lakes to support an annual average of 13,000 angler-use days through natural reproduction, habitat management, regulated harvest, and stocking when appropriate.

*Discussion:* Game fish conservation is not a primary purpose of this refuge, although it is a very popular managed use. Bluff Lake (1,200 acres), Loakfoma Lake (600 acres), Ross Branch Reservoir, creeks, and the Noxubee River harbor substantial fisheries. The primary game fish species include largemouth bass, crappie, bream, and channel catfish. The fishing season runs from March 1 through October 31 on all waters except the Noxubee River, which is open year-round. Bluff Lake, Ross Branch, and Loakfoma Lake have special bass regulations in effect. Personnel from Private John Allen Fish Hatchery in Tupelo, Mississippi, periodically restock largemouth bass, bream, and catfish in refuge lakes. Bow fishing for non-game fish only is permitted, with nighttime bow fishing allowed during April through August.

*Strategies:*

- D.2.1 Evaluate fishery resource annually using staff from Mississippi State University.

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- D.2.2 Coordinate stocking needs with Private John Allen National Fish Hatchery.
- D.2.3 Develop fishing piers at Bluff Lake for wheelchair access.
- D.2.4 Renovate docks and boat ramps and provide wheelchair access at Bluff and Loakfoma lakes.

*Objective D.3 Wildlife Observation and Photography*

Restore and improve overlooks, boardwalks, and trails, provide special guided and education program tours each season, and seek funding to develop an auto tour route with interpretive panels to provide observation opportunities and develop key resource awareness.

*Discussion:* Wildlife observation and photography are very popular managed uses and the demand for services and improved or new facilities is growing year-to-year on the refuge. Concentrations of waterfowl during the winter, egrets in spring and summer, and deer and red-cockaded woodpeckers attract numerous visitors year-round. Special programs to observe owls, alligators, and red-cockaded woodpeckers are conducted by the staff. Butterfly and dragonfly observation also has become increasingly popular in recent years.

*Strategies:*

- D.3.1 Maintain nature trails.
- D.3.2 Support Audubon Christmas Bird Count and other birding events.
- D.3.3 Support Xerces Fourth of July Butterfly Count.
- D.3.4 Advertise and maintain guided interpretive tours.
- D.3.5 Seek funding for auto tour route

*Objective D.4 Interpretation*

Increase interpretation activities to at least 15 events annually.

*Discussion:* Interpretation often plays a key role in helping refuge staff integrate conservation into the overall purpose of the refuge. Many opportunities exist for special events and volunteer guided programs, such as night hikes, bird tours, etc. The refuge manages a variety of services with limited staff and volunteers to support interpretation, including opportunities to discuss, teach, and demonstrate sustainable wildlife practices. Emphasis is also placed on providing teacher assistance, developing resource awareness, and encouraging community involvement and environmental stewardship.

Existing interpretive programs cover all types of resources including wildlife, forest, and cultural. Night prowls are held to give visitors the opportunity to view certain nocturnal wildlife such as owls and alligators. During Mississippi Archaeology Month, interpretive demonstrations are held whereby archaeological sites are excavated under the supervision of the Service's Archaeologist. Species interpretive programs are also held such as "Bluebird Workshops" in which children learn about the life history of bluebirds and actually construct a nest box.



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The refuge newsletter is another excellent tool for interpretation. Issued quarterly, it provides updates on nearly all refuge programs explaining the "how" and "why" behind many refuge management programs.

Interpretive panels are also located at key public use locations throughout the refuge, explaining what visitors may see at that location, as well as other visitor facilities located on the refuge.

*Strategies:*

- D.4.1 Maintain restrooms and potable water faucets for visitors.
- D.4.2 Maintain interpretive and directional signs, Internet web site, brochures, newsletters, public updates of events, and conservation awareness and activities.
- D.4.3 Construct a pull-off and information kiosk on Highway 25.
- D.4.4 Construct information kiosk at Morgan Hill Overlook.

*Objective D.5 Environmental Education*

Coordinate with Starkville School District, Mississippi State University, and other groups to teach required curriculum, share expertise, and host meetings at the Environmental Education Center, refuge outdoor classroom, and off-site locations to support 15,000 students annually. Initiate and support a Refuge Friends Group.

*Discussion:* In 1999, the Starkville School District and the refuge entered into a valuable long-term partnership. The school district built the Noxubee Conservation Center on refuge lands to provide environmental education within its district. The Service entered into a 50-year lease agreement and partnership with the school district. The Service owns the facility and it is operated and maintained by the school district. The school district supplies the director, seasonal interns, equipment, and curriculum, which are paid partly out of a grant from the Environmental Protection Agency. The curriculum addresses a wide selection of environmental topics to meet requirements. The part-time staff assists with teaching and curriculum development. Grant monies are managed through a special account administered by the refuge. The Service provides seasonal interns to assist the center's extremely limited staff which otherwise would be unable to support the various activities. Strong volunteer recruitment and training will remain important to support ongoing environmental education activities.

*Strategies:*

- D.5.1 Seek funding to construct and operate the additional phases of the Noxubee Conservation Center.
- D.5.2 Maintain facilities and manage programs to support education activities.
- D.5.3 Increase number of off-site programs and demonstrations to school groups, garden clubs, conservation clubs, retired citizens, etc.
- D.5.4 Develop teaching materials and host teacher workshops to promote environmental education and basic curriculum in local schools.

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- D.5.5 Encourage the development of a Refuge Friends Group and solicit volunteers to support environmental education programs.

*Goal E. Cultural Resources*

Identify and protect cultural resources in accordance with state and federal historic preservation legislation and regulations.

*Discussion:* Several themes are consistently present in cultural resource and historic preservation laws. They include: (1) each agency should inventory "historic sites" and assess the site's eligibility for the National Register of Historic Places; (2) consideration of impacts to cultural resources during the agency's management activities; (3) protection of cultural resources from looting and vandalism; and (4) consultation with groups such as Native American tribes and African American communities to address how management activities might impact archaeological sites deemed important to these groups.

*Objective E.1 Surveys and Investigations*

Conduct a refuge-wide archaeological survey by the year 2006.

*Strategies:*

- E.1.1 Conduct a comprehensive archaeological survey of the refuge and develop a GIS layer for the cultural resource sites.
- E.1.2 Produce an annotated bibliography of scientific reports and articles.

*Objective E.2 Protection*

Develop and implement planning and law enforcement procedures to protect the refuge's cultural resources and diminish site destruction due to looting and vandalism.

*Strategies:*

- E.2.1 Ensure that full-time refuge law enforcement officer completes Archaeological Resources Protection Act training course.
- E.2.2 Ensure that pertinent refuge staff complete the Section 106/Cultural Resources for Managers' training course.

*Objective E.3 Management and Education*

Manage known cultural resources in a manner that preserves their historical integrity and implement an educational program that will provide an understanding and appreciation of the human influence on the region's ecosystems.

*Strategies:*

- E.3.1 Establish an archaeologist position at the refuge to implement a comprehensive cultural resources management

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- program. This position would compliment the existing Regional Archaeologist position and be shared with other stations on the west side of the Service's Southeast Region.
- E.3.2 Plan management activities so they prevent or minimize disturbance to known cultural resources, such as the Old Robinson Road National Historic Landmark, graveyards, encampments, church sites, home sites, etc.
  - E.3.3 Design environmental education and basic interpretive programs that explain refuge history and resources in the context of human influences.
  - E.3.4 Work with local Native- and African-American communities to develop an education program regarding their cultural heritages.

*Objective E.4 Cultural Resource Partnerships*

Facilitate partnerships to manage cultural resources with pertinent state and federal agencies, State Historic Preservation Office, professional archaeologists, Native- and African-American communities, and the general public.

*Strategies:*

- E. 4.1 Seek a Memorandum of Understanding with the U.S. Forest Service and Mississippi Department of Wildlife, Fisheries, and Parks to enhance law enforcement of the Archaeological Resources Protection Act, the Native American Grave Protection and Repatriation Act, and Section 50 of the Code of Federal Regulations, as well as to facilitate investigations of Archaeological Resources Protection Act violations and unpermitted artifact collection on the refuge.
- E.4.2 Approach the Choctaw Nation and other pertinent Native-American groups for information on and input into the management of significant cultural and sacred sites located within the refuge.
- E.4.3 Identify potential avenues of archaeological and historic investigations and promote interdisciplinary research, such as the Jenkins' and Krause's investigations in the Tennessee-Tombigbee River Watershed.
- E.4.4 Negotiate an agreement with appropriate entities for the permanent curation of archaeological collections and associated documentation derived from archaeological investigations on the refuge.
- E.4.5 Expand existing partnership with Mississippi State University's Department of Anthropology to include more extensive surveys and research, and potentially the sponsorship of a graduate intern on the refuge.

*Goal F. Refuge Administration*

Develop, rehabilitate, implement, and maintain a comprehensive refuge facility, operations, and maintenance program responsive to supporting the management of fish and wildlife resources and the safety and experience of visitors.

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*Discussion:* Administration of the full range of refuge programs requires a collection of staff, equipment, facilities, and infrastructure. Maintaining and improving these resources are keys to effectively implementing refuge programs.

*Objective F.1 Equipment and Facilities*

Improve equipment, fleet, computer and communication systems, refuge entrance roads, buildings, structures, trails, and signs as appropriations allow and through existing partnerships. Seek additional partnerships to fund improvements.

*Discussion:* Operating the refuge at any level requires a basic infrastructure of buildings, roads, water control structures, etc., and a basic fleet of equipment to perform maintenance operations. Buildings are necessary to provide office space, house refuge employees, perform maintenance activities, and store equipment and supplies. Structures such as levees and water control structures are necessary for managing wildlife habitat. A variety of heavy and light equipment is needed to perform basic maintenance and habitat management activities such as grading roads, cleaning canals, installing firebreaks, conducting farming operations, etc.

Communication and data processing equipment has become more important to refuge operations over time. Communications equipment is now critical to providing adequate emergency response services such as law enforcement, fire control, and medical emergencies. Data processing equipment has become increasingly important to many refuge programs for purposes such as analyzing biological trends, conducting GIS and mapping activities, and general administration such as tracking budgets and processing personnel actions.

*Strategies:*

- F.1.1 Improve and maintain all refuge facilities to comply with safety standards and support biological, education, and visitor service program objectives.
- F.1.2 Continue cooperating with local and state highway officials to improve and maintain roadways.
- F.1.3 Educate local officials and Regional Office regarding refuge needs.
- F.1.4 Conduct Congressional briefings on issues affecting the refuge.

*Objective F.2 Operations and Maintenance*

Increase staff and seek funding to address inadequacies and improve expertise in all program areas. These measures are necessary to ensure adequate funding and support for managing trust species and public use programs.

*Discussion:* The refuge employs 17 full-time staff necessary to carry out refuge programs. Positions are designed to address all program areas such as biology, forestry, public use, law enforcement, fire

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management, facility maintenance, and administrative support. Each position requires a set of skills unique to that position. The refuge still lacks key staff positions to manage comprehensive biological, education, recreation, and cultural resource programs. The refuge's volunteer and intern programs have grown substantially over the past 5 years, primarily benefitting the biological and environmental education programs. Future growth will require additional permanent staff positions as well as increases in volunteers and interns.

*Strategies:*

- F.2.1 Add 14 staff positions necessary to fully implement management programs.
- F.2.2 Manage a comprehensive employee training program to ensure good working knowledge of program areas.
- F.2.3 Manage volunteer and student intern programs in such a manner that they compliment existing staff efforts, as well as provide meaningful and educational opportunities.
- F.2.4 Seek increases in refuge funding to support additional operations and maintenance activities as identified for each program area.
- F.2.5 Encourage the development of a Refuge Friends Group to support environmental education and other programs.



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